hydrogen energy

Testimony of Jonathan Briggs
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Mr. Chairman, members of the Committee, thank you for inviting me to testify before you today. My name is Jonathan Briggs, and I am Regional Director of the Americas for Hydrogen Energy International, a venture company jointly owned by BP Alternative Energy and Rio Tinto. Formed in May 2007, Hydrogen Energy started with the significant experience BP had already gained in developing industrial scale, base-load, low-carbon hydrogen fuelled power plants with carbon capture and sequestration (CCS). Furthermore, Hydrogen Energy is able to build on the complementary skills of its parent companies – BP's leading position and expertise in chemical processing and low-carbon power generation with carbon capture and storage; and Rio Tinto's expertise and world-class assets in resource extraction and supply.

Hydrogen Energy is currently developing two projects—one in Abu Dhabi, the other in California. The project that I will focus on today is the California project. Hydrogen Energy is siting the U.S. project in California because of the State's leadership role in requiring greenhouse gas emission reductions in policy initiatives supported by the Governor, Legislature, and energy regulatory agencies, including the California Public Utilities Commission and the California Air Resources Board.

Our project in California is located in Kern County, and will distribute to the California electricity grid 250 megawatts of much needed, baseload low-carbon power. The project's primary feedstock is petroleum coke, a refinery by-product, along with coal as needed, and will capture and store 90% of its CO2 emissions in the Elk Hills oil field for sequestration and enhanced oil recovery. The project has been designed and developed to provide numerous environmental and economic

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benefits for the state of California. For example, in California, water is of vital importance, and freshwater continues to be threatened in the State as a result of climate change. We have taken that into consideration for our project. The project will conserve fresh water sources by using brackish groundwater with zero liquid discharge. I will now briefly highlight the other benefits of this project to California—it will reduce the state's reliance on natural gas by diversifying energy feedstocks in the state, it will create about 1,500 construction jobs and 100 permanent jobs in an economically depressed region in the State and allow it to be the hub for a new low carbon energy center. The project will also significantly boost state and local tax revenue.

When selecting a site, we realized that in order to succeed we would need to locate the project close to both the CO_2 "sink" and transmission lines in order to avoid additional complexity. As a result, the project site is located such that we will need less than a five (5) mile pipeline to transport the CO_2 from the project site to the Elk Hills oil field, and less than five (5) miles worth of a trunk line to get the power to a major transmission line.

Just two months ago, the California PUC voted 5-0 to direct $30 million of support to our California project. This is unprecedented and a demonstration of the political leadership that first mover projects, such as ours, need. And while I have the opportunity, I would like to thank the California Public Utilities Commission, including Commissioner Gruenich, for recognizing the need for in-state, low-carbon baseload power.

We have filed for the planning permit and site license so if we are able to get the financial support we need, we believe we will be up and running by 2015.

In order to meet the aggressive emission reduction goals that are outlined in the draft "ACES" bill, CCS must be widely deployed, and quickly. The technology that is ready to go today at a scale used in commercial power plant generation is pre-combustion technology. That is why Hydrogen Energy is focussed on pursuing pre-combustion capture.

Pre-combustion also enables the production of hydrogen for other uses and makes it easier to eliminate many other air pollutants up front through the gasification process. And pre-combustion technology provides the best opportunity for achieving very high levels of capture. Hydrogen Energy projects

offer 90% capture rates, meaning that our project in California will easily exceed state requirements for long-term power procurement arrangements. Other capture technologies will scale up in time, but they still have the technology challenges facing them that we do not with the pre-combustion technologies. If we are to meet the 2050 GHG reduction targets, we can no longer wait. It has been estimated that a delay of as little as seven years in deploying carbon capture and sequestration technology could increase atmospheric concentration of CO2 by 10 ppm over the next 50 years. In addition, nearly all integrated assessments indicate that significant (70-80%) reduction of U.S. CO2 emissions by 2050 is either infeasible or significantly more expensive without widespread deployment of CCS. We must start now in order to achieve the material cuts in CO2 emissions that are needed to stabilize the climate and in order to drive down costs for future plants.

Just as pre-combustion capture technology is proven, so is the storage of CO2. In the US there are more than 3,500 miles of CO2 pipelines – used to transport CO2 to oil fields for use in Enhanced Oil Recovery (EOR) — an activity that has been conducted safely without major incident for more than 30 years.

Industry also has experience in sequestering large amounts of CO_2 in oil and gas fields, such as at In Salah, in Algeria, where BP is storing 1 million tons of CO2 per year, and also at the Weyburn project in Canada.

We believe that storing CO2 in existing oil and gas fields in connection with EOR will significantly advance the near-term deployment of CCS technology and geologic sequestration of CO2 for many reasons:

- Oil and gas formations offer the best characterized sites among potential sinks for anthropogenic CO_2;
- Much of the required infrastructure and operational experience is already in place;
- Existing regulatory requirements have proven to be an effective regulatory framework in protecting USDWs in the context of CO_2 EOR operations, evidenced by more than 30 years of experience in the Permian Basin and more than 25 years of miscible gas injection projects on the North Slope of Alaska (where CO_2 comprises 25% of the miscible gas injected); and

- Demand for large volumes of CO_2 for EOR is increasing, and can provide a revenue stream to supplement the economics of early-mover CCS projects.

The Department of Energy estimates that EOR has the potential to add 40-80 billion barrels of oil reserves in the United States, which is 2 to 4 times the current United States's total proven reserve. The Intergovernmental Panel on Climate Change (IPCC) has agreed that EOR technology can provide a significant kick-start on proving geologic sequestration of CO_2 on a commercial scale.

With these benefits in mind, we chose the Elk Hills field because it was part of the Strategic Petroleum Reserve for almost 80 years and the reservoirs are well characterized and understood, it has the ability to store over 1 billion tons of CO2, and it has excellent shale seals which will trap the CO2 more than a mile underground.

Like other forms of clean energy, CCS is more expensive than conventional energy. The extra processing plant and infrastructure needed for CO2 capture, transportation and sequestration brings with it both extra capital and operating costs as well as additional energy costs to run the additional processes. The majority of the extra capital cost lies with the power plant, rather than the sequestration activity.

The cost of CCS today is more than $100/ton of CO2. That may seem like a lot, but remember, this technology is still in the early deployment stages, and despite other technologies having enjoyed years of learning, low-carbon hydrogen power with CCS is already competitive with nuclear and renewable energies. So cost, while important, is not a reason to forego or stall the roll out of this technology that can make such a significant contribution to tackling CO2 emissions as found by leading academic institutions and experts some of which are sitting here. Further still, if built, the cost of the electricity from this project will be competitive with other forms of low-carbon power.

Hydrogen Energy is comfortable with the level of current technology risk because it has chosen pre-combustion separation of CO2 and storage in well-characterized, well-understood oil and gas formations. While all of the technologies have not yet been integrated in commercial power projects, HEI has the expertise and the willingness to lead industry deployment provided it is commercially reasonable to do so. What presents the greatest risk to these projects

is the economic risk associated with bringing first of a kind low carbon baseload power projects to market. This is an obvious place for the government to step in.

The draft ACES bill is a good first-step to identifying CCS as a needed technology to mitigate GHG emissions. Hydrogen Energy appreciates the support shown for CCS in the Waxman/Markey draft, particularly:

- Fixed incentive payments which are critical to project sanction;
- Feedstock neutrality; and
- Recognition of geologic sequestration combined with enhanced hydrocarbon recovery.

We believe that the government needs to support and encourage CCS, just as it does other low carbon energy technologies, and would hope that any climate change bill would include the following types of fiscal incentives:

- ***Tying fiscal support to the levels of CO2 capture***: Since we can achieve 90% capture today, we believe that incentives should avoid perverse incentives that encourage lower capture levels that have lesser environmental impact.
- ***Providing certainty for fiscal incentives***: Fixed payments, credits and subsidies provide this certainty, while floating value instruments such as bonus allowances are inevitably deeply discounted when project developers are evaluating project economics for final approval decisions.
- ***Don't penalize early movers***: We are taking on the most financial risk, and future projects will advance more quickly because of our experiences.
- ***Maintain feedstock neutrality***: Addressing climate change requires mitigating emissions from the use of all fossil fuels; energy policy should not be driven by any single fossil fuel.
- ***Recognize importance of oil and gas reservoirs***: Sequestration in oil and gas formations (which are currently much better characterized and understood than other potential geologic

reservoirs for CO2) have a key role in the near-term deployment of CCS technologies.

- ***Provide clear and definitive qualification terms***: Incentives should be automatically granted based on technical performance and date of deployment, rather than a potentially subjective and prolonged selection process.

Before I close, I would like to leave the Committee with one other recommendation regarding the regulatory certainty needed to allow CCS to move forward. Early projects are likely to involve CCS in conjunction with enhanced oil recovery (EOR) so regulatory frameworks need to acknowledge EOR and sequestration can be combined and occur simultaneously – injection of CO2 for EOR is already regulated and we can provide assurance that during EOR, CO2 is simultaneously sequestered. We appreciate that the Committee acknowledged that in the discussion draft. However, we would also urge that the Committee ensure that there is only one regulator and one set of regulations for CCS in order to reduce complexity, avoid redundancy and ensure that these CCS projects get off the ground quickly and become the widespread technology we need it to be in order to ensure GHG emission reduction.

I would like to thank the Committee for inviting me to testify before you today and remind you that CCS is ready today, we just need fixed, near and medium-term financial incentives to get these important projects off the ground.